

**Addendum to Proposal Submitted to the
U.S. Army Corps of Engineers, Portland District**

by

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Title: **Avian Predation on Juvenile Salmonids in the
Columbia River Estuary**

Requested Dates: **March 1, 2005–September 30, 2005**

Proposing Agencies: USGS-Oregon Cooperative Fish and Wildlife Research Unit
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**Objective 2. Research, monitor, and evaluate predation by double-crested cormorants on
salmonid smolts in the Columbia River estuary.**

Task 2.7 Determine taxonomic identity and relative population (subspecific) status of the double-crested cormorant.

The Double-crested Cormorant (DCCO; *Phalacrocorax auritus*) is a North American avian species that not long ago faced serious threats to its persistence primarily due to heavy contaminant loads picked up in their fish prey. Their remarkable recovery starting in the 1970's was primarily due to the banning of DDT and other contaminants. Recently, increased aquaculture and fisheries activities have resulted in an opposite effect (i.e., extreme population growth) in many locations. The Columbia River estuary is one of the areas that has experienced a population explosion of DCCO (*P. a. albocilatus*); East Sand Island supported 0 pairs of DCCO in 1977 whereas approximately 11,000 pairs nested there in 2003.

Management efforts for this species vary across North America depending on its local status and perceptions regarding its role as a nuisance species. For example, the extensive breeding population of DCCO in the Columbia River estuary is a concern relative to juvenile salmonid survival. An estimated 4.8 million juvenile salmonids were consumed by DCCO in 2003 during a period of good ocean productivity and thriving alternative prey populations. Their predation level on juvenile salmonids exceeded that of Caspian Terns (*Sterna caspia*) in 2003. Current management in the Columbia River estuary calls for reduction of Caspian Terns in order to reduce their take of juvenile salmonids. Substantial effort went into determining the regional status of the Caspian Tern population prior to initiating an Environmental Impact Statement on their management. Similarly, it is now important to determine the geographic boundaries and population status of the DCCO subspecies present in the estuary prior to initiating NEPA documentation and implementing appropriate management actions on this species.

One important aspect in beginning this examination of the effect of DCCO in the Columbia River is to understand its taxonomic identity and relative population status. This is best achieved via a comparative molecular genetic approach that includes the five described subspecies of DCCO. As yet no genetic work has been carried out to confirm or reject these groupings: *P. a. auritus* occurs in eastern and central North America; *P. a. cincinatus* breeds in Alaska; *P. a. albocilatus* breeds along the Pacific coast from British Columbia to Baja California and inland to New Mexico, Utah, Montana, and Sinaloa, Mexico; *P. a. floridanus* is a resident in Florida and the Caribbean; and *P. a. heuretus* is a resident of some Bahama islands.

For this study, we propose to use molecular methods to determine the status (i.e., subspecies or not) of these traditional subspecies and their geographic boundaries so management goals for DCCO in the Columbia River estuary will be appropriate relative to the rest of the species. While we have samples from all five subspecies, the proposed work will focus on the subspecific and geographical distinction between *P. a. auritus*, *P. a. cincinatus*, and *P. a. albocilatus*.

Dr. Dan Roby (USGS Oregon Cooperative Wildlife Research Unit) will collect tissue from DCCO on the Columbia River estuary and elsewhere in Oregon and Washington using the following protocol: <http://fresc.usgs.gov/staff/haig/conservation/>. Via collaboration with biologists throughout North America, we will also collect tissue samples from across the species breeding range so as to be able to address subspecies and population structure questions at any scale. Already, we have established a number of partnerships throughout the DCCO range and expect to have most sampling finished by fall 2004. Dr. Susan Haig (USGS Forest and Rangeland Ecosystem Science Center) and her staff will perform the molecular analyses and write the final product (in collaboration with Dr. Roby). We will use sequences from the control region, ND2, and ND6 genes from mitochondrial DNA (mtDNA) to examine subspecies and population differentiation. We will follow-up by using microsatellites to examine fine-scale population structure including an analysis of genetic diversity. This double marker approach will provide us with the most robust approach to answering questions related to birds on the Columbia River.

Results of this work will provide managers with the ability to judge the relative population status of DCCO across North America and fine-tune their activities accordingly. Relative to the Columbia River estuary DCCO population, efforts to understand this localized population

relative to the regional population can be initiated and formulation of management prescriptions can subsequently be developed.

References:

Hatch, J.J., and D.V. Weseloh. 1999. The Double-crested Cormorant (*Phalacrocorax auritus*). In: Birds of North America No. 441, (A. Poole and F. Gill, eds). The Birds of North America Inc., Philadelphia PA.